DOCUMENT RESUME

ED 259 837 PS 015 168

AUTHOR Paris, Cynthia L.
TITLE Skills and Concepts of Successful Young Computer Users.
PUB DATE Mar 85
NOTE 19p.; Paper presented at the Microworld for Young Children Conference (College Park, MD, March 8-9, 1985).
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Computer Literacy; Computer Software; *Curriculum Development; Early Childhood Education; Integrated Activities; *Learning Activities; *Skill Development; *Young Children

ABSTRACT

Answers to questions about how children successfully use computers were found by identifying computer skills and concepts achieved by children attending the 1984 Computer Camp for Young Children at the University of Delaware. A total of 43 children from 4 through 7 years of age attended 1-1/2 hour sessions each day for 4 weeks. Computer activities were embedded in a supporting curriculum of materials and activities designed to precede or extend computer experiences. Children received instruction or coaching in specific computer skills as the need arose. During the last 3 weeks of the camp, teachers recorded children's performance on a list of computer skills thought necessary for successful computer use. This paper first succinctly identifies seven skills demonstrated by all successful children and five concepts about the nature of computers the children understood. Then, for each concept and skill, sample activities and materials are suggested as stimuli to planning. Concluding remarks caution readers that the information presented in the article does not constitute a prescription for successful computer activities with young children, but should be regarded as a demonstration of a way of thinking about computer use in early childhood education through which curriculum materials and activities were generated. (RH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

ED259837

Skills and Concepts of Successful Young Computer Users

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Cynthia L. Paris

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Cynthia L. Paris
University of Delaware*
March 1985

PS 015168

* Currently at University of Pennsylvania

Young children who are successful computer users are comfortable, confident and, to a great extent, independent at the machines. They approach the computer without hesitation. They load and start the computer without checking repeatedly with an adult to be certain they did it "right." They call on a teacher to show what they have done more often than to seek help. In fact, they eagerly share their computer skills with children or adults who need help. And when presented with a new piece of software, or even a different computer, they explore them with aplomb, using what they know of software and computers in general.

How does a young child become a successful computer user? What must children be able to do or understand before they can use a computer with ease?

Skills and Concepts for Successful Computer Use

Some answers to these questions were found by identifying the computer skills and concepts achieved by a group of successful young computer users who attended the 1984 Computer Camp for Young Children at the University of Delaware.* Forty-three children, ages 4 though 7, attended 1-1/2 hour sessions each day for four weeks. Some had previous computer experience; some had more. Some could read; some could not.

* The Computer Camp for Young Children is a program of CAPP, the Computer Active Preschool Project in the College of Human Resources at the University of Delaware, Newark, Delaware.

During the last three weeks of the camp, teachers recorded the children's performance on a list of computer skills thought by the staff to be necessary for successful computer use. Seven of these skills were demonstrated by all the successful children. They were the ability to

- turn all machine components on and off
- load the software properly
- locate necessary keys on the keyboard
- use a single keystroke
- match movements of a handcontroller to those desired on the monitor
- select options from a single menu
- use and begin to generate procedure.

Based on the conviction that skills learned without understanding of their potential uses are meaningless, the skills were taught in conjunction with concepts about computers.

Concepts, however, are rarely demonstrated in discrete behaviors that can be tallied on checklists. But important ideas about computers were uncovered in guided discussion with the children and in their spontaneous speech and behavior. The young children in this study demonstrated the five understandings about computers:

- a computer is a machine with strengths and weaknesses
- a computer is made up of parts working together to take in, act on and send out information

- computer hardware and software is made by people and controlled by people
- children can use computers to draw, play games, write stories, help them practice skills, and save information
- some adults use computers to help them do their work in the community and in their homes.

These skills and concepts reflect a program focus on teaching young children to control the computer, and to understand how computers can be used for their purposes. This focus differs from one in which children are simply taught by the computers.

Conditions Accompanying Successful Computer Use

How did the children achieve these skills and concepts? Though this cannot be answered with certainty, the context in which they did so can be described.

The computers were integrated into a developmental classroom setting. They were available to the children every day during an independent work period. Children were free to use the computers when they chose, with whom they chose, using software of their choice. There were no assigned "computer times" or arbitrary lists determining when or for how long a child could work at a computer. Without such artificial constraints, a child felt no pressure for immediate mastery and could explore and become competent at their own pace.

Children received instruction or coaching in specific computer skills as the need arose. Teachers provided directed instruction at the computer to a single child or pairs, rather than to full classes. Instruction given in this manner proved effective because learning was applied immediately in response to a real need and led to immediate feelings of success. For teachers this method proved to be an efficient use of time because interested onlookers learned as well and all were available then to teach others.

The computers were embedded in a supporting curriculum of materials and activities to precede or extend computer experiences. Computer skills and concepts were developed in all parts of the curriculum.

Materials and Activities Accompanying Successful Computer Use

For each computer concept and skill identified above, sample activities and materials follow. They are presented as suggestions rather than prescriptions; as stimuli to planning rather than a program to be adopted.

Activities and materials from all curriculum areas and all parts of the day were designed to nurture children's computer concepts.

A computer is a machine. Most of the children discussed many of the computer's qualities that defined "machineness" for them, for example, switches, wires, and parts that moved. But children's comments such as "I worked at three computers - the

Atari®, the Apple® and the typewriter" revealed misconceptions of what distinguished computers from other machines. When computers were included, however in a unit of study on machines, comparisons could be made, and distinctions clarified. On a "Machine Walk," four-year-olds withdrew cash from a bank's automatic teller, then used it to wash preschool laundry at the laundromat. It could be pointed out that the computer in the automatic teller could do many jobs, give money, take money, tell how much money you have. The washing machine could do only one job - wash. The computerized teller remembered who you were if you told it your secret code. The washing machine would never remember you. Limitations of the computer were dramatically presented in an Art Show, the culmination of a full day of creating with computer graphics and with traditional art materials. Because of the careful selection of materials, it became clear that while you could see, and sometimes hear computer art, you could neither feel it as you could a texture collage, smell it as you could the scented paints and markers or walk around it as you could a sculpture.

A computer is made up of parts working together to take in information and send out information. When teachers consistently used correct terminology for parts of the computers, the children could easily identify all parts. The understanding of the interdependence of the parts developed as children were introduced to the concepts of "input" and "output."

Children cannot touch and manipulate input processing and output. But cooking and art activities provided analogous opportunities for children to physically put materials in, process them, and take them out. Peanuts and oil were input; the blender was the CPU and peanut butter was the output. Soap flakes, dry tempera and water were input; a hand mixer the CPU; and finger paint was the output.

Relating the concepts of input and output to their own bodies has been an effective way to help children build these concepts. They receive information or input through their eyes, nose, mouth, ears, and skin. They send out most information or output through their mouth. Their CPU is their brain.

As children worked as a team to build a giant computer, they demonstrated their understanding of computer parts and their related functions. Their computer received input through its disk drive (a box with a hold for cardboard disks), the CPU was the child inside the computer, and output was shown by that child through the acetate monitor.

Computer hardware and software are made by people and are controlled by people. If young children believe milk comes from grocery stores, not cows, imagine their misconceptions about computers. Given the opportunity to help or observe while a technician repairs the class's disk drive, or to meet a parent who visits with an unfinished robot he's building at home, children's understanding become more realistic.

When children are able to work with programmers to design lessons or games, or make changes in their software, they gain direct experience with the human origins of computer technology (Wright, 1984). When these experiences accompany the many times that children successfully command the computer to draw or build or write what they choose, they are likely to begin to feel in control of the computer. It is this concept that appeared to be critical to children's as well as teacher's confident use of computers.

Children can use computers to draw, play games, record and animate stories and help them practice academic skills. It is unfortunate that many children will only see a computer as a tutor that asks questions and verifies or negates the correctness of their answers. What children come to know of a computer's capabilities may be limited by the software selected for them software selected for them by teachers and parents. Only by having opportunities to use a wide selection of software, including graphics, word processing, primitive programming, and true programming will a child understand some of the powerful capabilities of a computer.

Adults use computers to help them do their work in the community. On a morning of errands, a child and his parent may encounter computers when they withdrew money from the bank, check out their order at the supermarket, and buy hamburgers at a fast food restaurant. If they carry that meal to the others parent's workplace, it is likely they may find a computer there as well.

With careful planning, young children can be made aware of the many uses of computers in the community through field trips, visitors and dramatic play.

Field trips should demonstrate uses of computers that are clearly visible such as watching pattern maker print patterns, or a geographer create maps. Procedures in which they can participate such as weighing produce after keying in the price per pound on the grocer's computerized scale, or putting information into a computerized gas pump are most appropriate for young children who must act to understand.

The value of playing out their understandings of computer uses after such trips cannot be overemphasized. Young children must work and rework their computer experiences through dramatic play. Props for these dramatic play settings can be as simple as a cardboard box and some imaginations to create an automatic teller.

To feel successful at the computer, children must possess skills necessary to work without frustration or failure. In some cases the teacher can help a child develop these skills. In others it may be more appropriate to modify the task to match the child's skills.

Turn the Machine On and Off. Children had no difficulty manipulating switches or knobs, but recalling the order in which they should be done was frustrating for teachers and children alike. Task modification was an appropriate solution. Numbered

stickers on each switch provided the necessary cues to those still learning the sequence of the procedure.

Load and Unload Disks. The children had the necessary fine motor skills to load the disks and handle them appropriately with reminders and modeling by teachers. Disks were displayed in their covers on walls or bookboards adjacent to the disk drives. Because only the labeled edge of the disk was visible, children were more likely to grasp the disks properly.

Locate Keys on a Keyboard. The greatest obstacle to children's comfortable use of the computer appears to be their keyboard skills (Karnes, Barton, Krause, 1984). Children can be given many keyboard experiences before and between their exposure to computers. Typewriters have long been popular with young children. Typing activities that required that children search for specific letters rather than just randomly tap keys helped them become familiar with the keyboard.

Hopping on the keys of a giant floor keyboard helped children learn the spatial arrangement of the keyboard. They were reminded to always begin from the bottom of the keyboard. Bulletin boards and matching games can provide practice in keyboard skills as well when children match or manipulate keys.

Activities devised for use with these materials are most effective if they require the children to use the specific keys that they will need to use your software. "Type Your Name" is good preparation for software requiring that the children identify themselves. A game, such as "Do you like ...?", in

which children type their "yes" or "no" responses, help them locate those keys needed to respond to yes or no choices on some menus.

While keyboard activities and, experience at computer keyboards will eventually lead to mastery, children need to locate necessary keys easily even when first using computers to feel successful. Some software manufacturers provide stickers to place on the front of necessary keys with symbols that indicate their function. Some teachers recommend marking necessary keys with colored tape. A mask or frame over the keyboard exposing only necessary keys allows children to use a piece of software easily, but may not help them learn where those keys are found in relating to the rest of the keyboard.

Software that focuses on reading or writing skills often requires a great deal of keyboard knowledge. In word processing, the child is expected to compose sentences, spell the words in those sentences, and locate all the necessary letters on the keyboard to type those sentences. While either the language arts skills or the keyboarding skills alone would prove challenging, together they may become frustrating to a young child.

When first using a word processor to write stories, writing down a basic story on paper with a teacher before coming to the computer, has proven helpful. The child may then concentrate on typing and learning to use the composing options that allow him to amend and elaborate on his story as he wishes.

Use a Single Keystroke. Computer keyboards are often sensitive, and when a child depresses a key for too long, the computer responds as to a series of keystrokes. For many children, fine motor activities that focused their attention on the duration of a finger movement were necessary. A buzzer board provided auditory feedback as the child attempted to make short or long buzzes, then Morse code sequences of shorts and longs.

Keyboard practice on electric typewriters was preferable because the sensitivity of the keyboard was more similar to that of a computer than a manual typewriter. They also were beneficial to children who would strike two or more keys simultaneously. When doing so on a computer, it was not always clear to the child that the computer responded to only one of those keystrokes, and not necessarily the one the child had intended. The electric typewriters however, jammed and rumbled if more than one key was pressed, making it clearer to the child that only single keystrokes caused the desired effect.

Match movement of the hand controller to those desired on the monitor. To successfully use a hand controller, a child must be able to orient the hand controller properly, control small movements of her hand, and transfer information between the horizontal and vertical planes.

Small arrows and printed words indicate the "top" of the hand controller so that the user can orient it properly. A growing child may need a clearer indicator attached. Hand controllers can also be fastened to stationary surfaces in the

correct position. When first learning to use a hand controller, children may be frustrated by software that requires the accurate movements to make menu selections or progress through a maze. Graphics software, in which a child is free to experiment with the effect of moving the hand controller may provide a more appropriate introduction to the hand controller.

When using a hand controller the child must be aware that movements of the hand controller on the horizontal plane correspond to movements on the vertical monitor. A forward movement, for example, on the hand controller, causes an upward movement on the monitor. Activities that require a child to transfer information between the vertical and horizontal planes can precede or accompany children's introduction to computers. Copying pegboard positions from one plane to another, or locating a hidden object in the sand table in locations marked on a vertical board are examples of this type of activity.

Select options from a simple menu. Some software that is developed for non-readers or beginning readers have picture menus from which the child must make a choice. But often menus are printed. By trial and error or repeated readings by an adult, even non-readers learn that if they press "2" they will get the choice they want. But rebus menus attached to the disk sleeve provide the necessary information in picture form so that children can make menu selections independently. This is an important consideration, not only in terms of effective use of a teacher's time, but in fostering independent and confident young computer users.

Begin to plan procedure to achieve specific results.

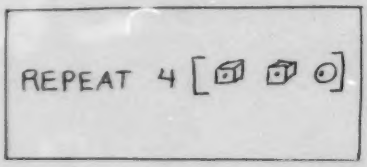
Programming for children, whether it be a programming software such as, Creature Creator, (Design Ware 1983) Spinnaker, 1982) or Facemaker, assumes the child's ability to think "procedurally," that is, to see an end result as a series of sequential steps. Children must be allowed much time for experimenting with the possible features and motions of the monsters in Creature Creator before they begin to purposefully program dances. Likewise, children spend a great deal of time exploring the possible movements of the screen turtle before they are ready to program a procedure to draw a square.

But prior to or during the time that they explore and plan procedure on the computer, children can learn to think procedurally in other classroom activities. Children can be given many experiences of the following procedures that have carefully been broken down for them into sequential steps. As children became familiar with following prccedures, they could be expected to, when given the steps, put them in the correct order to follow. Very simple procedures such as spreading peanut butter on crackers are appropriate.

Then children will begin generating procedures, if they can modify them as they go along. One child may act as a computer waiting for commands to draw a bear. Directions are given sequentially, and incorrect or unclear directions are immediately obvious.

To progress from exploration with single keystrokes to planning procedures, a child needs a goal. A child giving LOGO-like commands to a child in robot costume, may move her randomly FORWARD, BACKWARD, LEFT or RIGHT until given the goal of getting her safely to a goal. Children carefully consider which command to give next when trying to get a turtle robot to a specific house to deliver the mail. Looking at a path or maze, planning direction and distance commands to be tape recorded, then followed encourage children to plan out a whole procedure rather than one step at a time. Many cooking, art and science activities can be presented as step-by-step procedures to follow to reach a goal. (See Veitch B. and Hains, T., 1981 for examples of cooking activities presented in this way).

Procedures that include REPEAT notation can be introduced in bead stringing, for example. Instruction cards can be produced by teachers or children that direct a child to add beads to the string in a repeated pattern.



Repeated sections of songs and dances can be noted in similar fashion on song charts and used by children before they begin generating such procedures at the computer.

Summary and Conclusion

Even with careful preparation and support for successful computer use, there are times when class teacher supervision will

be required. When a new piece of software is introduced, teachers often need to read cues and directions, explain menu choices and help children locate the special purpose keys required. A child who wishes to save or print her work will often need a teacher to help her though these procedures. Young children using wordprocessing may also be more dependent on an adult for assistance and encouragement.

But in most other situations, teachers can help young children be successful if they maintain appropriate expectations for their young children working with computers. These expectations must be derived from careful analysis of the tasks children must perform as they use each type of hardware, and each piece of software. Each of these tasks must be judged against one's knowledge of child development to determine which skills young children might reasonable be expected to possess or develop.

Secondly, we must help children develop the necessary skills that can be expected. Careful observations of a class and of individual children will help determine what off-computer experiences or coaching at the computer will be needed.

Finally, teachers must adapt some computer tasks to allow children to procede with the learning task at hand without becoming frustrated.

Conclusion

One final condition was present in the classrooms of successful young computer users. It was the presence of teachers who were excited by the challenge and potential that computers offered them. They saw ways to use computers to help them reach

some of the goals they had for their children. Among these were the desire to help children feel competent in their environment, and to use the tools in their environment to solve their own problems and generate their own creations as well as a general sense of confidence. Just as their successful children had been given the skills necessary to use computers, and the assurance that they could use them for their own purpose, in their own style and at their own pace, these teachers were given the necessary skills to operate computers, understanding of many potential uses of computers with young children, and the freedom to put the computer to use for their purposes, in their style and at their own pace.

The information in this article should not be regarded as a prescription for success for children or for teachers. It suggests ways of thinking about computer use in early childhood classrooms and how these thoughts generated curriculum materials and activities. Successful teachers will use this information to generate their own solutions to meet their own needs.

References

Design Ware. "Creature Creator." 1983

Karnes, M., Barton, R. W. and Krouse, M. Preliminary research results reported at LASE/CEC National Conference and Training Workshop on Technology in Special Education. January 1984.

Quinn, C. and Weinstein, M. "Facemaker." Spinnaker Software Corporation. 1982.

Veitch, B. and Hartms, T. Cook and Learn. Addison-Wesley Co. 1981.

Wright, J. L. "Educator, Programmer and Child: A From Approach." Presented at the National Conference on Computers and Young Children. Newark, De. April, 1984.